REMARKS

Claims 1-6 and 9 have been rejected under 35 U.S.C. §102(b) as anticipated by Kusase et al (U.S. Patent No. 5,483,116), while Claims 7 and 8 have been rejected under 35 U.S.C. §103(a) as unpatentable over Kusase et al in view of Ragaly (Japanese patent document JP 411285214A) For the reasons set forth hereinafter, however, Applicants respectfully submit that all claims of record in this application distinguish over both Kusase et al and Ragaly, whether considered separately or in combination.

The present invention is directed to a vehicular alternator of the type that includes permanent magnets for auxiliary excitation. In particular, the alternator according to the invention has a rotor which is constructed with a pair of opposing "claw-type" magnetic poles which are nested together in a manner such that the respective claws of the two poles are interdigitated, and separated by gaps, as best seen in Figure 7. In order to enhance the magnetic flux in the magnetic circuit formed between the rotor and the stator, permanent magnets 7 are inserted between the opposing surfaces of the respective interdigitated claws 5Aa2, 5Ba2, etc.

In conventional vehicular alternators of the type described, including, for example, the Kusase et al reference, the claws of the respective magnetic poles are tapered along their axial extent, so that each claw is thinner (in the radial direction) at its tip than it is at its base. Thus, the claws have a substantially

triangular shape in a longitudinally and radially extending sectional plane, as can be seen, for example, in Figures 1 and 6 of the Kusase et al patent (elements 15 and 16). As a result of this configuration, when a permanent magnet that has a relatively wide dimension in the radial direction of the rotor is disposed between adjacent claws of the claw type magnetic poles, a portion of the magnetic pole surface (that is, the surface of the magnet which faces and is sandwiched against the opposing surfaces of adjacent claw-type magnetic poles) does not make contact with the claw. This can be seen, for example, in Figure 1 of Kusase et al in which the lower right-hand portion of the magnet 11 does not make contact with the claw-type pole 16. (Similarly, the lower left-hand portion of the magnetic pole surface of the magnet 11 does not make contact with the claw-type pole projection 15.) As a result, the resistance to a flow of magnetic flux (and therefore, the magnetic loss) in a magnet circuit formed by the permanent magnet is increased, and the magnetic flux of the permanent magnet is not effectively utilized.

The present invention addresses and resolves this problem by providing each of the claw-type magnetic poles with a shape such that its surface which faces and abuts the magnetic pole surface of the adjacent permanent magnet makes contact with the entirety of such pole surface. In a first embodiment, illustrated in Figures 2 and 3, auxiliary magnetic pole portions 21 are provided at the lateral edges of each of the claws 5Aa and 5Ba. Although the respective claws are tapered along most of their circumferential extent, as indicated by the dotted line in Figure 2 the circumferentially lateral sides have downwardly

extending auxiliary magnetic pole portions 21 which have a rectangular face that corresponds to the rectangular shape of the magnetic pole surfaces of the permanent magnets. Thus, the claw itself makes contact with the entirety of the magnetic pole surface of the permanent magnets.

Several other embodiments are disclosed. For example, in the embodiment illustrated in Figure 6, the claws 5Aa2, 5Ba2 are not tapered in the axial direction, but rather have a uniform thickness in the axial direction, so that the inner surface thereof is substantially parallel to the outer surface. Thus, each of the claws makes contact with the entirety of the magnetic pole surfaces of the permanent magnets. In this regard, it is noted that the specification specifies that the term "magnetic pole surface" refers to the rectangular lateral surfaces of the permanent magnet 7 in the circumferential direction of the rotor. (See page 12, lines 21-23 and page 13, lines 17-23.)

The Kusase et al reference, discloses a rotor for a rotating electric machine which includes interdigitated opposing claw-type magnetic poles, which are generally similar to those of the present invention. However, as noted previously, as in conventional electric machines of this type, the respective claws or fingers 15, 16 of the opposing magnetic poles are tapered, becoming gradually thinner in the radial dimension toward their axial tips, as can be seen in Figures 2 and 6. Thus, as explained previously, the circumferentially lateral surfaces of the respective claws or fingers 15, 16, do not make contact with the entire magnetic pole surfaces of the adjacent permanent magnets against which they

are abutted. This can be seen in both Figures 2 and 6, and in Figure 9 as well. In Figure 9, in particular, it can be seen that the ends of the claw-like magnetic poles 15, which are visible in the drawing, are radially thinner than the adjacent magnets, and do not extend radially downward over the entire lateral magnetic pole surface of the adjacent permanent magnets.

Claim 1 of the present application recites that each of the plurality of claws of the rotor has a shape such that the opposing faces of adjacent claws are in contact with the entire magnetic pole surfaces of the permanent magnets, which are disposed therebetween. As noted previously, this feature is made possible, while still maintaining a generally tapered configuration for the bulk of the respective claws, by means of the downwardly extending auxiliary magnetic pole portions 21, which cover the surface of the adjacent magnets. Accordingly, Claim 1 distinguishes over Kusase et al, which does not address the same problem, or suggest any such solution.

Claim 7 is limited in a manner similar to Claim 1, reciting an embodiment in which an auxiliary magnetic pole plate is interposed between each of the plurality of claws and the adjacent permanent magnets, and further that each auxiliary magnetic pole plate has a shape such that it makes contact with the whole of the magnetic pole surfaces of the permanent magnet.

In regard to the latter limitations of Claim 7, the Office Action refers to the Ragaly reference, and particularly Figure 16, stating that the elements m2

and m3 are in contact with the whole of the permanent magnet m1. However, Applicants note in this regard that Figure 16 of Ragaly is a cross-section, which shows nothing concerning the shape of the elements m2 and m3 in a plane perpendicular to the plane of the drawing. Accordingly, Figure 16 discloses nothing about the shape of the elements m2, m3 in such a plane, or whether they have a uniform vertical dimension, and whether they in fact have a shape such that they cover the entirety of the magnetic pole surfaces of the permanent magnet 8. (Nothing in any of the remaining Figures 7 or 8-13 provides any such disclosure, either.) Accordingly, the Ragaly reference contains no disclosure that the "elements m2, m3 contact the whole of the magnetic pole surface of the permanent magnet m1."

Claim 3 further distinguishes over the Kusase et al reference in the recitation that the auxiliary magnetic pole portion has a greater thickness at a radially outer portion than at a radially inner portion thereof. This feature, which is illustrated in Figure 4, is neither taught nor suggested by Kusase et al.

Finally, Figure 4 further distinguishes over Kusase et al, reciting that a radially inner surface of each claw is substantially parallel to a radially outer surface thereof. As noted previously, however, because the claw shaped pole elements 15, 16 of Kusase et al are all tapered in the axial direction, as shown in Figures 1 and 6, it is apparent that the inner surface thereof is not parallel to the

outer surface thereof. In this regard, Applicants note that because Figure 3, referred to in the Office Action, is a cross-section, it provides no information concerning whether the inner surface and the outer surface are in fact parallel (as opposed to their linear intersections with the plane of the drawing).

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #381KA/50358).

Respectfully submitted,

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